

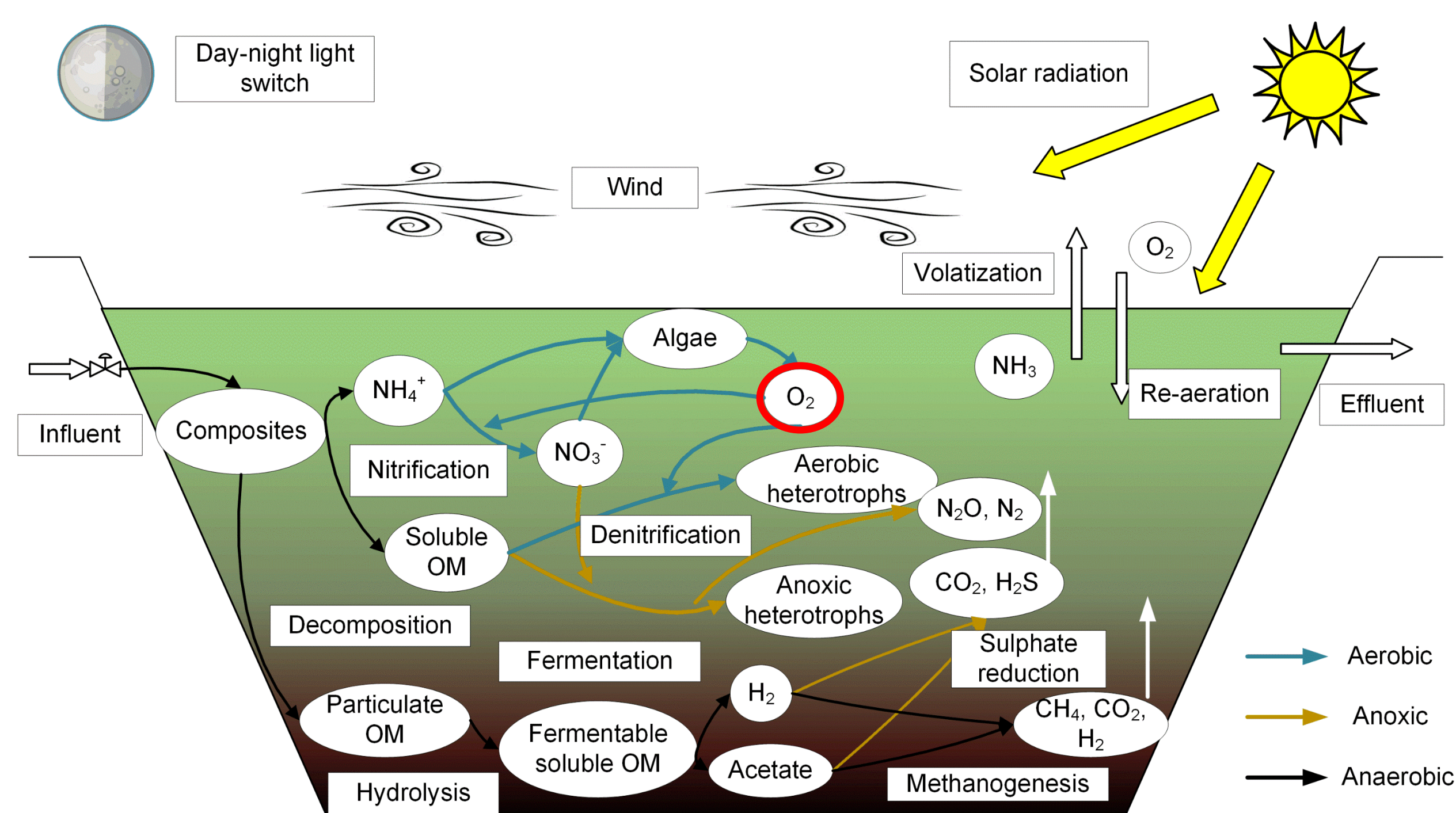
AECO RESEARCH UNIT - DEPARTMENT OF APPLIED ECOLOGY AND ENVIRONMENTAL BIOLOGY – GHENT UNIVERSITY

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SPATIOTEMPORAL EFFECTS ON OXYGEN LEVEL IN WASTE STABILIZATION POND AT HIGH ALTITUDE

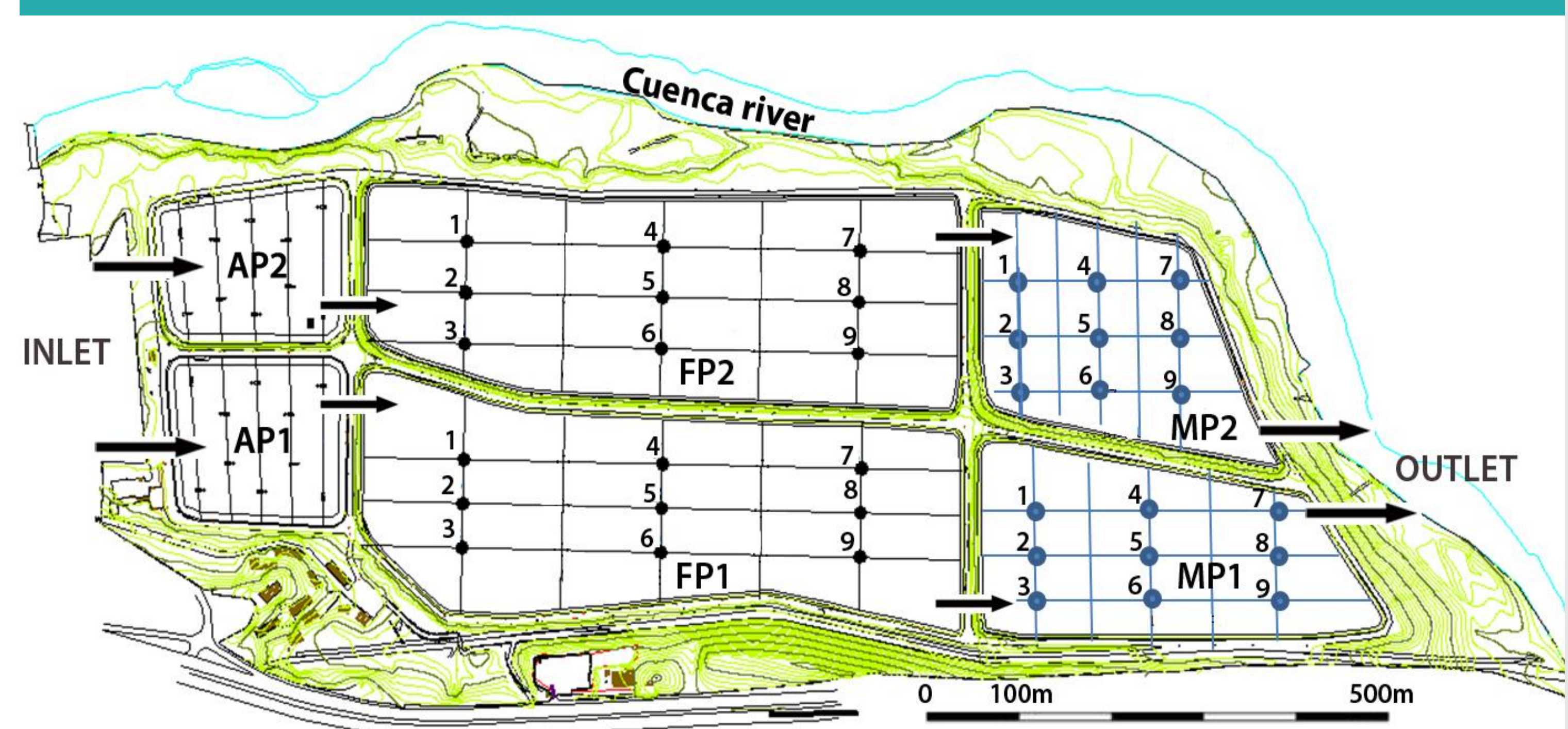
Introduction

- Simplicity, low cost, robustness and high efficiency
- Dependence on climatic conditions, especially at high altitude.



Materials and methods

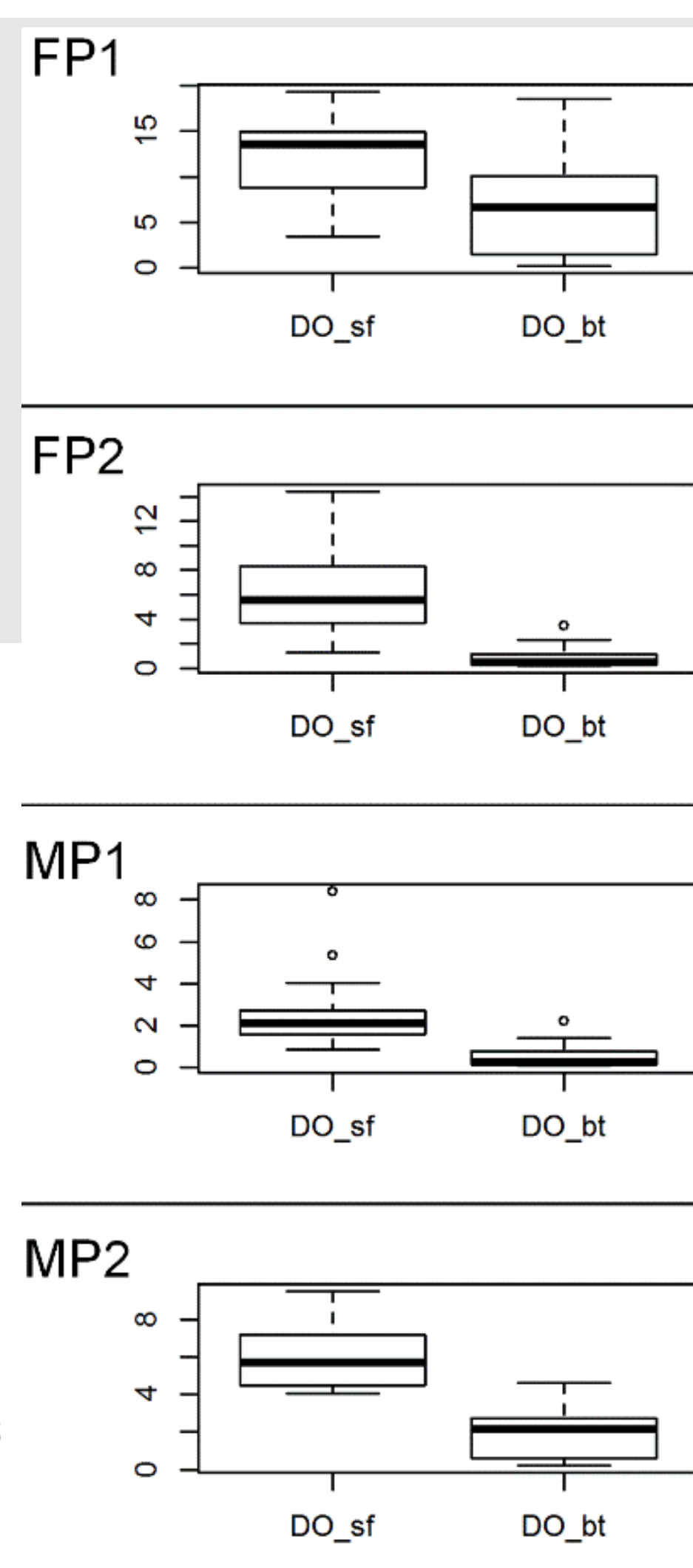
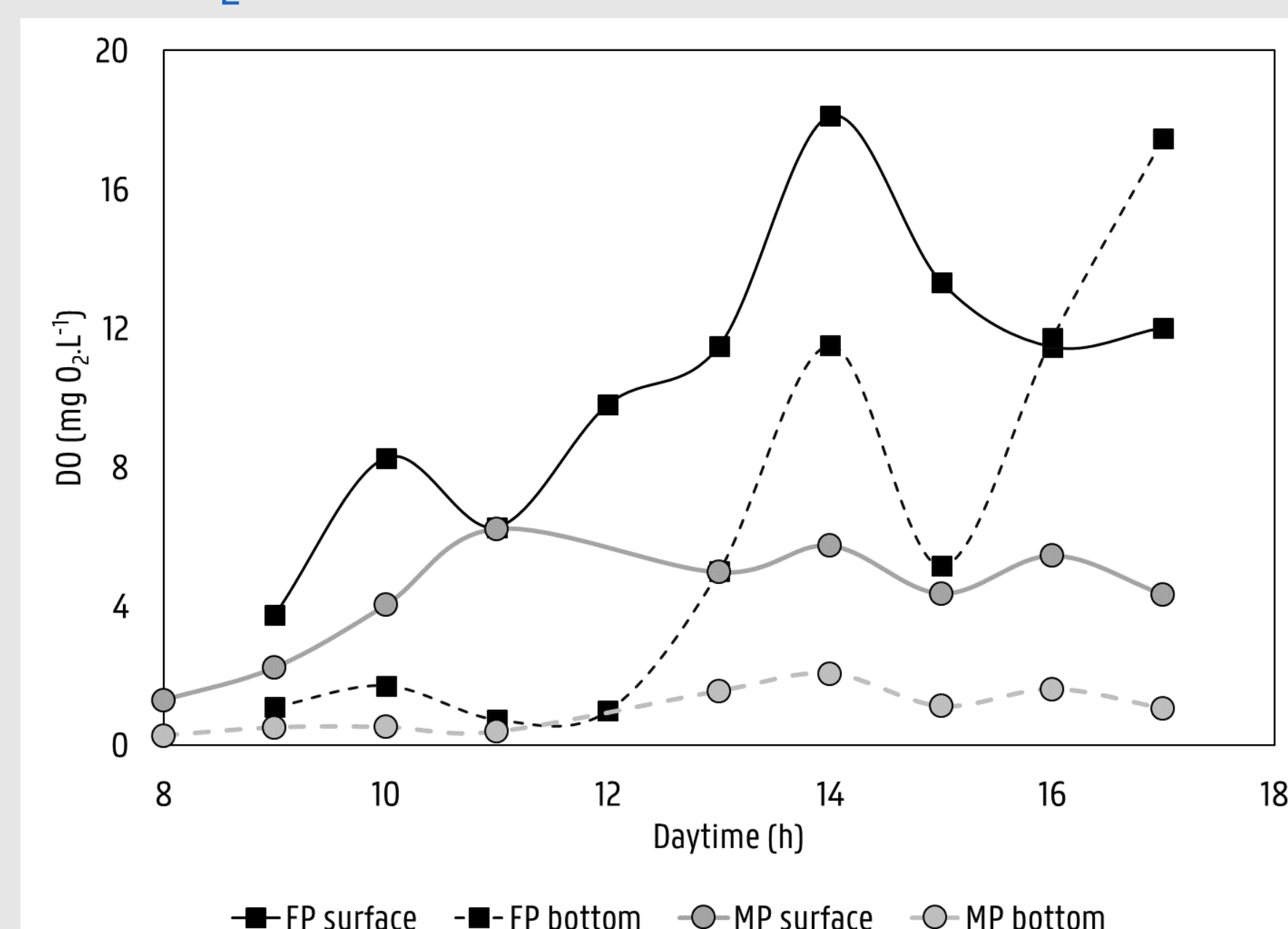
- Located at Ucubamba WSP in Cuenca, Ecuador
- Two parallel lines: an aerated pond, a facultative pond and a maturation pond



Results and discussion

Spatial and temporal variations

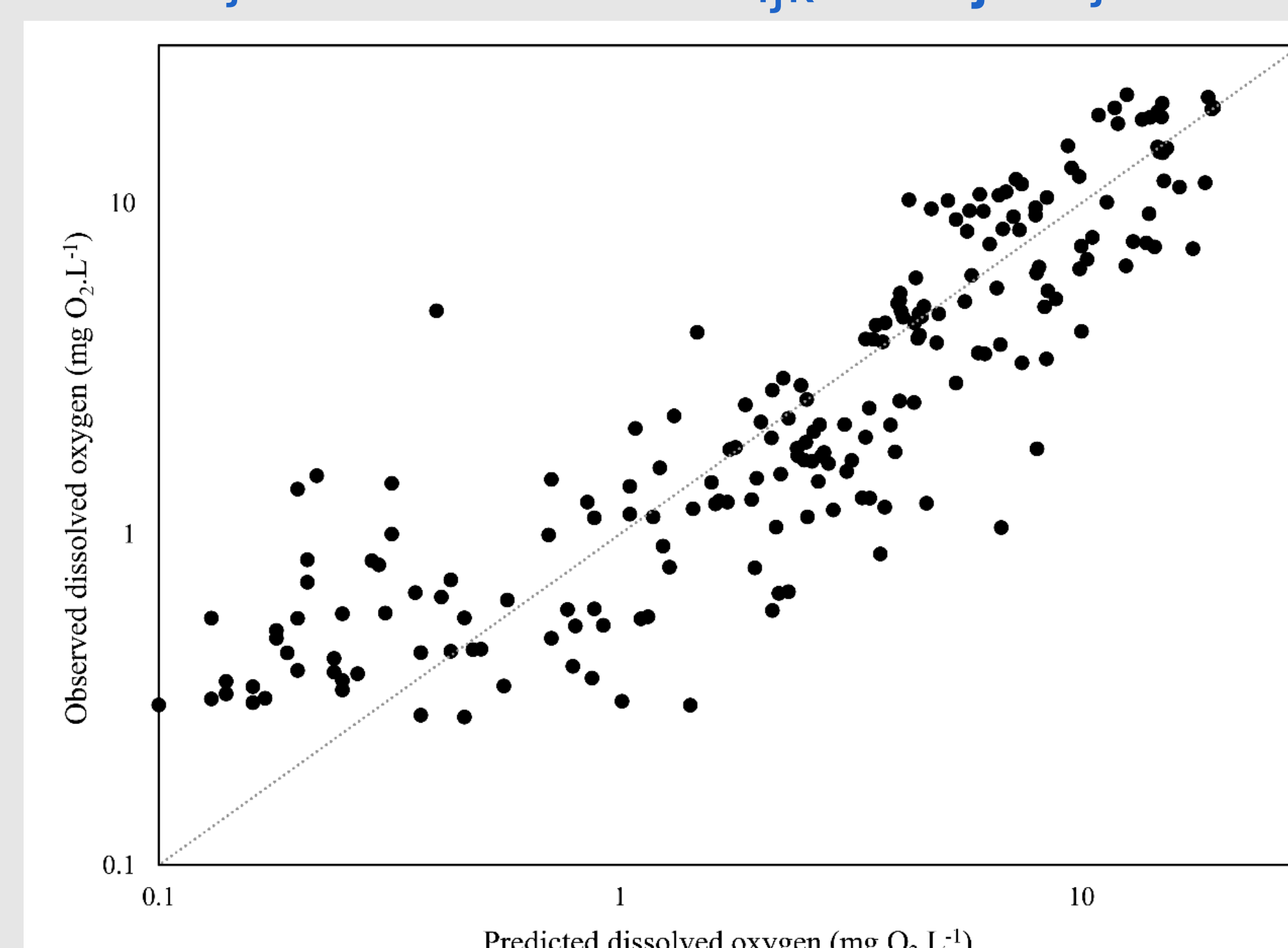
- Higher values in terms of both concentration and variation were found close to the surface
- Due to high solar radiation ($\approx 1400 \text{ W.m}^{-2}$), oxygen concentration could reach up to $39 \text{ mg O}_2\text{.L}^{-1}$



Linear mixed effect models

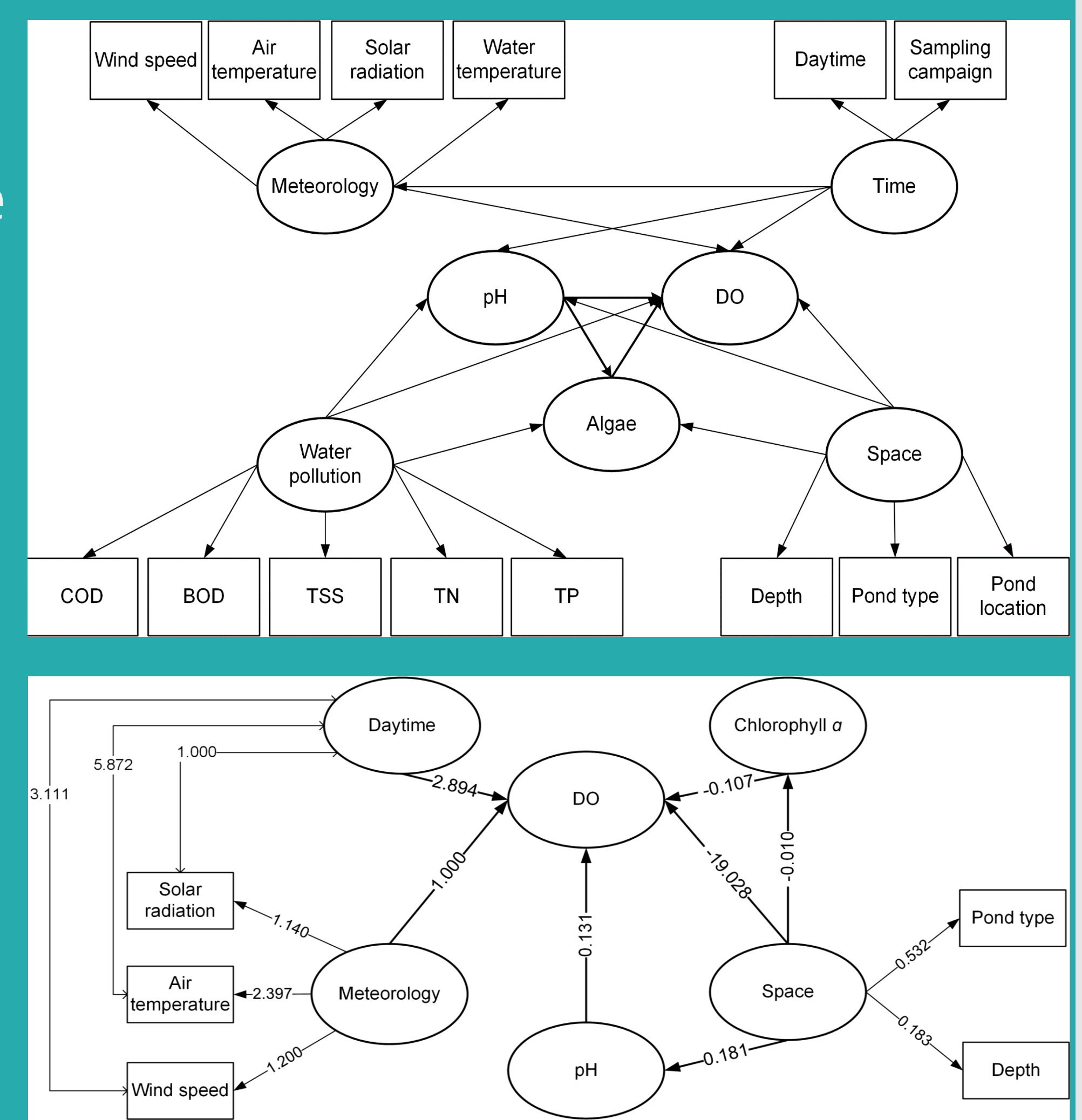
$$\log DO_{ijk} = -3.276 + 0.01 \times BOD_{ijk} + 0.0005 \times \text{Chlorophyll}_{ijk} + 0.174 \times \text{Water.temp}_{ijk} - 0.352 \times \ln \text{Depth}_{ijk} + 0.2 \times \text{Daytime}_{ijk} - 0.0068 \times \text{Daytime}_{ijk}^2 + a_k + a_{jk} + \epsilon_{ijk}$$

- Goodness-of-fit increases from 64% to 79% after including spatiotemporal effects as random effects



Structural equation modeling

- 4 latent variables: meteorology, water pollution, time, and space
- SEM allows for the estimation of direct and indirect effects of latent and manifest variables.
- Non-significant effect of water pollution on oxygen level
- Substantial effect of daytime and space on DO



Conclusions

- High altitude caused lower removal efficiencies.
- DO had vertically and horizontally different patterns within and among ponds.
- SEM and mixed model proved their capacity on predicting the variation of DO, hence, are highly recommended in future pond modelling.

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